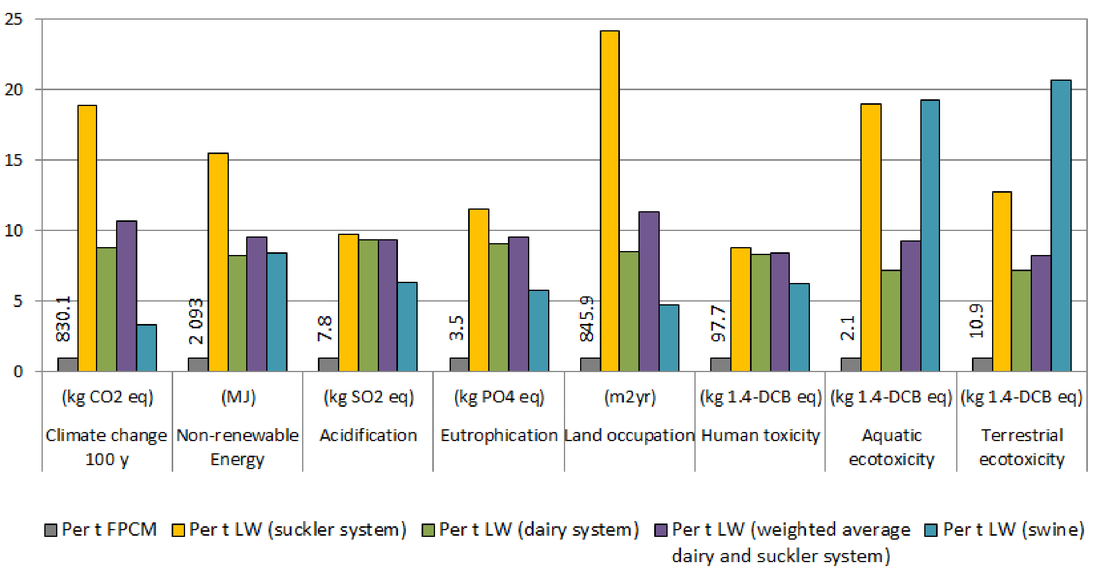
Modelling environmental effects of selected agricultural management strategies with regional statistically-based screening LCA

SETAC Europe 26th Annual Meeting, **LCAS06**

Step	Method	Brittany case study
1	Construct a farm typology.	Farm typology: Dairy + crops, beef + crops, swine + crops, poultry + crops, crop-only.
2	Construct virtual representative farms (VRFs) based on regional statistics.	Virtual farms representative of Brittany's agricultural production were constructed based on regional statistics and the AGIBALYSE life cycle inventories database.
3	Estimate environmental impacts per farm type.	Life cycle impact assessment of each farm type was performed, using the VRFs as the source of LCIs.
4	Extrapolate farm type results into the total land use in the region.	Regional statistics were the basis for a linear extrapolation of environmental impacts estimated per farm type and per main animal product (from the VRFs).
5	Construct scenarios of agricultural management practices.	LCIs from VRFs were modified to represent the effects of specific agricultural management practices, derived from the CANTOGETHER (http://www.fp7cantogether.eu/) project. Environmental impacts for the scenarios were estimated by recalculating LCIAs and re-extrapolating them to the total land use in the region.

Baseline

Baseline impacts, all farm types, per various functional units, relative to FPCM



Values are generally within value ranges calculated for France and OECD by AGRIBALYSE and various publications (e.g. de Vries and de Boer 2010, Daalgard et al. 2014)

Agricultural strategies:

→100GRA (dairy farms) → Grass specialisation: all dairy farms maximise grasslands (90% forage area) and adjust other feed inputs (maize silage, concentrates); milk yield lowers

→100SIL (dairy farms) → Maize silage specialisation: all dairy farms maximise maize (40% of forage area) and adjust other feed inputs; milk yield increases

→50FOD (dairy and suckler farms) → 50% of cattle farms grow and coal-dehydrate lucerne (17% of forage area, displacing grasslands) to partially replace concentrates (ratio 2.5:1), while adjusting other feed inputs

→50REW (all farm types) → 50% of all farms growing crops (including animal + crop farms) sets aside 10% of grasslands (towards rewilding/renaturalisation)

→50GME (swine and crop farms) → 50% of swine farms have all their animal feed input needs, except for soya bean products) satisfied by crops grown by themselves and by all crop-only farms

REMARKS:

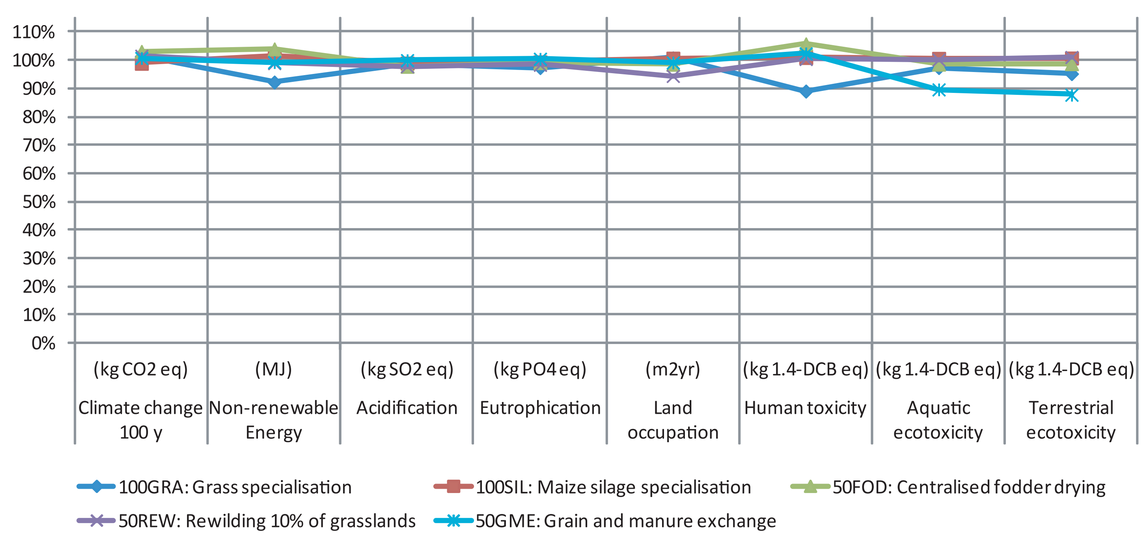
All LCAs are performed at the screening level, because inventories of VRFs do not represent actual farms but a statistics-based definition

Cattle and swine VRFs baseline assumed homogenous feeding strategies, all VRFs assumed homogenous land use across farm types

But → the modelling method allows for comparing agricultural strategies at the regional level, and predict deviations from the baseline, in environmental terms

Socio-economic indicators are needed to rank strategies regarding sustainability and accomodate the diverse priorities of all concerned agriculture stakeholders

Regional impacts (relative to the baseline) of implementing strategies, all farm types, per ha



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